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US 4980940 A US 4680822 A
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# (54) BEDDING

(57) The bedding eg a sleeping mat 1 has bacteria eg contained in sheet form 4 comprising at least one of Eubacteriales, Actinomycetes and Algae with at least deodorant activity. A far infrared emitting substance 5 is also incorporated therein. The bedding has odour destroying and/or masking properties as well as satisfactory warming properties.

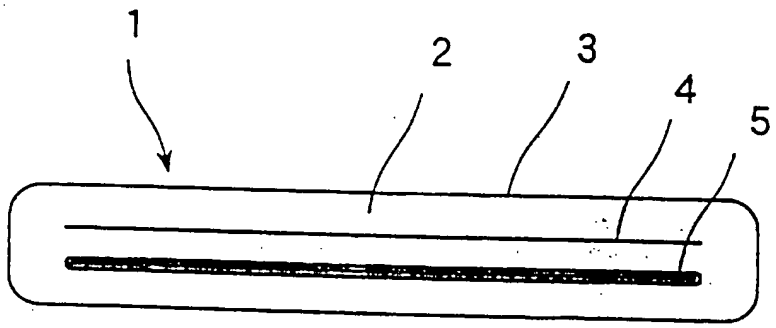


FIG. 1

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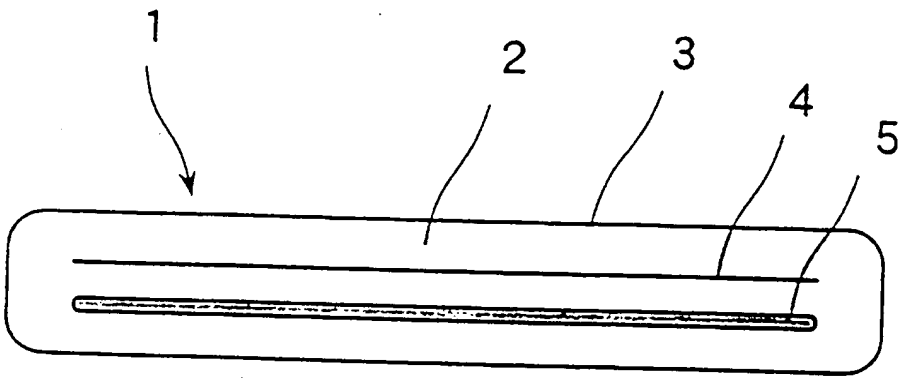


FIG. 1

# BEDDING

This invention relates to bedding.

Sleeping mats begin to smell after repeated use, especially when patients, elderly people, and babies must frequently or continuously lie and rest thereon for a long time. Such contaminated sleeping mats can cause bedsores (or decubiti) and can inflame allergic skin.

The present invention seeks to provide bedding having odour destroying and/or masking properties as well as satisfactory warming properties.

According to the present invention, there is provided bedding having bacteria with at least deodorant activity and having a far infrared emitting substance incorporated therein. Preferably the bacteria are soil bacteria which may be aerobic. More preferably the soil bacteria are actinomycetes and/or algae.

The term "bedding" as used herein encompasses mattresses or sleeping mats and bedclothes including sheets, blankets and covers; that is, all pieces of fabric used for sleeping purposes.

Due to the incorporation of a far infrared emitting substance, the bedding of the invention has satisfactory warming properties for the person who lies thereon. Soil bacteria act to decompose substances which would otherwise serve as nourishment for microorganisms, typically the bacteria which cause bad odours, so that the said substances are no longer nutritious. This suppresses further propagation of the microorganisms, thereby destroying or inhibiting odours.

As used herein "far infrared" means having a wavelength of at least 25 μm and extending up to the limit of infrared which is generally taken as about 1,000 μm.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawing, in which:-

Figure 1 is a schematic cross-sectional view of a sleeping mat according to the invention.

Referring to Fig. 1, a sleeping mat is illustrated as a typical example of the bedding according to the invention. The sleeping mat 1 includes a filling 2 and a covering 3. The covering 3 is stuffed with the filling 2 while a bacteria-bearing sheet 4 and a far infrared emitting substance-bearing sheet 5 are buried in the filling 2. Preferably the sheets 4 and 5 extend over the entire area of the mat 1.

The filling 2 may be made of a natural material such as cotton, wool, silk and camel's hair, or a synthetic material such as polyester or rayon fibres. The covering 3 may be a closed bag made of conventional fabric made from a natural material such as cotton, wool or silk, or from a synthetic material such as polyester or rayon fibres.

The bacteria-bearing sheet 4 includes a base sheet formed as a non-woven fabric made from natural fibres such as cotton or hemp, or synthetic fibres such as nylon, polypropylene or polyester. Bacteria are carried on the base sheet. The bacteria are preferably soil-borne bacteria, typically Eubacteriales, actinomycetes and algae. Useful are Eubacteria such as ammonia-oxidizing bacteria, nitrate bacteria, Pseudomonas, Streptomyces and

Penicillium, actinomycetes such as Nocardia and algae such as blue-green algae.

Exemplary soil bacteria include ammonia-decomposing bacteria or nitrite bacteria (Nitrosomonas, etc.), nitrate bacteria (Nitrobacter, etc.), sulphur-oxidizing bacteria or sulphur bacteria (bacteria utilizing hydrogen sulphide as a hydrogen donor, green sulphur bacteria, for example, aerobic bacteria such as Beggiatoa and Thiobacillus), cellulose-decomposing bacteria (aerobic and anaerobic bacteria), manganese-decomposing bacteria (heterotrophic bacteria), manganese-reducing bacteria (aspergillus niger and protobasidium), nitrifying bacteria, actinomycetes (chitin-decomposing bacteria), methane-oxidizing bacteria, sporangium, cellulose molds, lignin-decomposing fungi, iron-oxidizing bacteria, iron-reducing bacteria and sulphate-reducing bacteria. Especially useful in the practice of the invention are bacteria such as nitrite bacteria, nitrate bacteria, sulphur bacteria, cellulose-decomposing bacteria and Pseudomonas, actinomycetes such as Streptomyces and Penicillium and algae such as blue-green algae. These bacteria are either aerobic or anaerobic, with aerobic ones being preferred.

The actinomycetes have characteristics intermediate molds and bacteria and are either aerobic or anaerobic.

The ammonia-decomposing bacteria (or nitrite bacteria) and nitrate bacteria change ammonia-form nitrogen into nitrate-form nitrogen. This action is called nitration and is known to proceed in the following two stages.

$$NH_3 + 30 = HNO_2 + H_2O$$
$$HNO_2 + O = HNO_3$$

The ammonia-decomposing bacteria (or nitrite bacteria) contribute to the early stage of oxidizing ammonia into nitrite, whereas the nitrate bacteria contribute to the later stage of chemically converting the resulting nitrate into nitric acid.

These soil bacteria prevent the generation of odours in accordance with the following principle. Soil bacteria decompose, oxidize or reduce substances which can serve as nourishment for microorganisms causing bad odours (e.g., nitrogenous materials) so that these substances lose their nutritious properties, thereby suppressing the propagation of the microorganisms and preventing the generation of odours. Soil bacteria, especially actinomycetes, utilize phagocytosis to kill bad odour - generating microorganisms and act to coagulate or settle materials which can be nutritious for microorganisms, thereby effectively reducing the amount of available nutrients for the microorganisms.

In the practice of the present invention, one or more of the above-mentioned bacteria can be used. It is preferred to use actinomycetes in combination with algae because carbonate anabolism concomitant with formation of algae supplies oxygen to the aerobic actinomycetes to promote their propagation.

The actinomycetes and algae may be used in any desired ratio. The bacteria preferably includes about 0.5 to 3%, especially 0.8 to 2% of actinomycetes and about 0.05 to 2%, especially 0.1 to 0.5% of algae.

Soil bacteria are supported on a carrier, for example, by adding soil bacteria to water, fully stirring the mixture to form an impregnating solution, dipping a piece of fabric as the carrier into the solution for a suitable length of

time, pulling out the carrier and allowing the carrier to dry. Other suitable impregnating methods can be employed.

It is noted that soil bacteria are cultivated, for example, by inoculating a strain into a culture medium and aerating and stirring the medium. The culture medium is preferably a neutral liquid culture medium containing a carbon source such as glucose, sucrose, maltose, dextrin, glycerin or starch, a nitrogen source such as peptone, meat extract, yeast extract, malt extract or casein, and an inorganic salt such as NaCl, $K_2HPO_4$, $MgSO_4$ or $CuSO_4$. The medium is preferably at about pH 5 to 8, more preferably about pH 6.5 to 7.5, most preferably about pH 7.2 and is at a temperature of 20 to 35ºC, more preferably about 30ºC.

The amount of soil bacteria carried on the carrier is preferably $5x10^8$ to $200x10^8$ cells/$cm^3$, more preferably $10x10^8$ to $100x10^8$ cells/$cm^3$ although it varies with the impregnating procedure and especially the cultivating conditions and the culture medium composition.

For details of soil bacteria, reference is made to (1) OKAMI Kichiro and OMURA Satoshi, Microorganisms and Their Application, No. 5, Summary of Antibiotics Production, Kyoritsu Publishing K.K. (1979), (2) UDAGAWA Shunichi et al, Bacteria Encyclopedia, Vol. II, p. 1195 ff., Kodansha Scientific K.K. (1977), and (3) SUDO Ryuichi, Microorganisms for Environmental Cleaning, Kodansha K.K., (1982).

The far infrared emitting substance-bearing sheet 5 is preferably a sheet made from synthetic fibres such as polyester or rayon in which oxide ceramic particles capable of far infrared emission are incorporated. The oxide ceramic particles capable of far infrared emission used

herein are prepared, for example, by adding a metal oxide such as titanium oxide, zirconium oxide and tin oxide to clay, followed by sintering. Examples include $ZrO_2$-$SiO_2$ ceramics, $Al_2O_3$-$SiO_2$ ceramics, $TiO_2$-$Cr_2O_3$ ceramics, $Al_2O_3$-$(Si,Ti)O_2$ ceramics, and $(Al,Fe,B,Cr)_2O_3$-$SiO_2$-(alkali metal, alkaline earth metal) oxide ceramics.

The oxide ceramics have far infrared emitting properties in that, when warmed to a temperature of 35.5 to 36.5ºC, which is approximately equal to human body temperature, they emit electromagnetic radiation having a peak wavelength of 8 to 14 μm corresponding to the human body's infrared absorption wavelength, as well as far infrared radiation of a wavelength greater than 25 μm.

In the illustrated embodiment, the soil bacteria and the far infrared emitting substance are borne on separate carrier sheets, although they can be borne on a common carrier sheet. Alternatively, the soil bacteria and the far infrared emitting substance may be directly applied to the filling 2 or the covering 3 without using carrier sheets. In this sense, it is within the scope of the present invention to carry the soil bacteria and the far infrared emitting substance on the covering 3.

Experiment

A sleeping mat of the structure shown in Fig. 1 was prepared using a filling 2 of wool, a covering 3 of cotton fabric, a bacteria-carrying sheet 4, and a far infrared emitting substance-bearing sheet 5.

The bacteria-carrying sheet 4 was prepared by adding 1 litre of a culture solution containing ammonia-oxidizing bacteria and nitrate bacteria to 10 litres of water.

bacteria and nitrate bacteria to 10 litres of water. Thorough mixing resulted in an impregnating solution, into which a 150 cm x 100 cm piece of fabric (Estar manufactured by Asahi Chemicals K.K.) was dipped for 3 minutes. The fabric was pulled out and dried.

The far infrared emitting substance-bearing sheet 5 was commercially available as the far infrared emitting fabric known as "Liteace" manufactured by Unitika K.K. It was cut to 150 cm x 100 cm.

A number of such mats were offered to elderly patients who rested on the mats for several days. As to the result of such use, the patients answered that they fell into a deeper sleep with these mats than before with conventional mats. The mats were continuously used for 5 days without washing whereupon still no odour was perceivable. Furthermore, no bedsores were caused and no allergic skin was inflamed.

There has been described a sleeping mat which has odour-destroying and masking properties as well as satisfactory warming properties so that the user who lies thereon may feel comfortable and hygienic, without bedsores being caused or allergic skin being inflamed. The mat is especially suitable for long term patients.

CLAIMS:

1. Bedding having at least one of Eubacteriales, Actinomycetes and Algae with at least deodorant activity and a far infrared emitting substance incorporated therein.

2. Bedding as claimed in claim 1, wherein at least one of the Eubacteriales, Actinomycetes and Algae are soil bacteria.

3. Bedding as claimed in claim 1 or claim 2, wherein at least one of the Eubacteriales, Actinomycetes and Algae are aerobic.

4. Bedding as claimed in claim 2 or claim 3, wherein a combination of Actinomycetes and Algae is used.

5. Bedding as claimed in claim 1 and substantially as hereinbefore described.

6. Bedding as claimed in claim 1 and substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

The Patent Office

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**Application No:** GB 9616017.1
**Claims searched:** 1-6

**Examiner:** John Graham
**Date of search:** 14 October 1996

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A4M. A4S.

Int Cl (Ed.6): A47C. A47G.

Other: ONLINE DATABASE: WPI

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | US 4980940 | (TADAO) see eg col 3 lines 40-52 | 1 |
| X | US 4680822 | (SANGYO) see eg col 1 lines 52-58 | 1 |
| X | WPI Abstract Accession No 96-233458/24 & JP 8089376 | (SAKURAMOTO) see abstract | 1 |

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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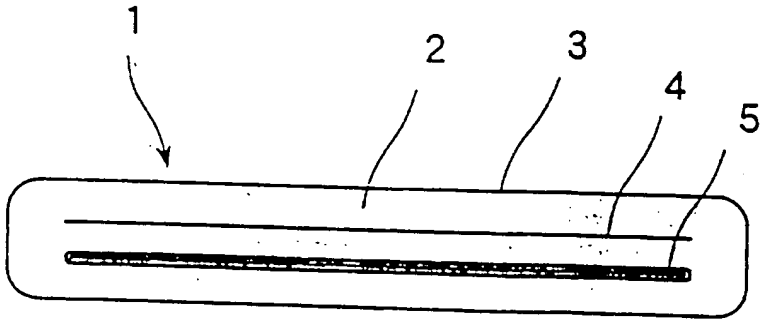


FIG. 1

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